

ENVIRONMENTAL SAMPLING OF AIRBORNE PARTICULATE RADIONUCLIDES

Purpose

This Meteorology and Air Quality Group (MAQ) procedure describes the methods for collecting particulate samples from the air sampling stations, preparing the samples for analysis, and submitting the samples for analysis for airborne radionuclides.

Scope

This procedure applies to the collection, preparation, and submittal of the filter papers used to collect airborne particulates as part of the AIRNET monitoring system.

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General information about this procedure

Attachments	Number	Attachment Title	No. of pages
	1	Hazard Review	2
	2	Directions to AIRNET Sampling Stations	4
	3	Air Monitoring Field Data Form and Chain of Custody Record	1
	4	Computer-Generated Field Data Form and Chain of Custody Record (Example)	1
	5	AIRNET Filter Clumps Form (Example)	2
	6	AIRNET Critical Station Checks (Example)	1
	7	Memo Detailing Total Activity of the Shipment (Example)	1
	8	Sample Shipping Checklist	1

History of Revision

Revision	Date	Description of Changes
0	--	Revision number not used.
1	1/4/91	New document, issued as ESH-8-202.
2	5/14/91	Revision to process.
3	5/9/94	Put into new format; process updated.
4	4/18/95	Update Attachment 1 indicating new and relocated samplers; remove references to tritium cartridges; add instructions for inoperable or damaged samplers.
5	12/18/95	Revision to shipping instructions; remove Be analyses request; update sampler locations.
6	5/15/96	Change filter material, add electronic recording of field data, change tracking of sample period by color of filter head, revise field form, add form for composites.
7	9/24/96	Expand steps for inoperative pumps, add example of electronic data recording as attachment, add actions for station 90, add field safety information to prerequisites.
8	2/20/97	Update station list, add safety considerations, add new sample preparation processes and forms, add records submittal deadlines.
9	7/31/97	Update station list, add steps for critical sta. checks.
10	3/9/99	Add details for preparing shipping paperwork; changed biweekly and compositing processes to reflect use of whole filters.
11	4/27/99	Revise filter handling and compositing steps to reflect change to front face counting of filters.

History of revision continued on next page.

General information, continued

History of revision, continued

Revision	Date	Description of Changes
12	11/3/00	Delete laboratory c-of-c attachment, editorial changes, add shipping checklist, rewrite chapter <i>Critical Station Checks</i> , add form Critical Station Checks.
13	3/13/01	Removed chapter on compositing to new procedure, updated station list, added three trip blanks.
14	11/01/01	Revised to reflect use of Palm computer devices, revised some steps about sample handling, and revised handling of station 90 filters.
15	2/28/03	Updated station list, revised instructions for preparing cover memos, and other minor editorial changes.
16	12/14/04	Change criteria for flow adjustment, replaced “JCNNM” with “electrician”, replace HCP with HR.

Who requires training to procedure?

The following personnel require training before implementing this procedure:

- MAQ personnel assigned to collect and process AIRNET samples

Training method

Training to this procedure will be by **on-the-job** training conducted by a previously trained individual and will be documented in accordance with the procedure for training (MAQ-024).

Personnel trained to revision 15 of this procedure may retrain by **read** training.

Prerequisites

In addition to training to this procedure, the following training is also required prior to performing this procedure:

- MAQ-011, “Logbook Use and Control”
- MAQ-204, “Sampling of Ambient Airborne Tritium”
- MAQ-205, “Calibration of Air Sampling Stations”
- MAQ-216, “Management of AIRNET Field Data”
- RRES-ES-Field, “Field Safety For All Employees”
- RRES-ES-Driving, “Driving and Towing Safety For All Employees”
- PS-13 training “Hazard Communication Introduction” (course # 2398)

References

The following documents are referenced in this procedure:

- MAQ-024, “Personnel Training”
- MAQ-026, “Deficiency Reporting and Correcting”
- MAQ-032, “Orienting New Employees”
- MAQ-204, “Sampling of Airborne Tritium”
- MAQ-205, “Calibration of Air Sampling Stations”
- MAQ-216, “Management of AIRNET Field Data”
- MAQ-AIRNET, “Sampling and Analysis Plan for the Radiological Air Sampling Network (AIRNET)”

Background and worker safety

AIRNET system principles of operation

The Meteorology and Air Quality Group's network of air-monitoring stations (AIRNET) uses filter media to collect airborne particles. These filters are analyzed for various radionuclides. The samples are generally changed out on a two week basis but can be collected more frequently to evaluate short term releases and emergency response situations. The AIRNET sampler (LANL-210B Model by SAIC) operates by drawing air through the sample filter which traps the radioactive particles. By recording the flow rate of the vacuum pump at the beginning and the end of each sample period and the length of time the pump ran, the total volume of the air that passed through the filter can be calculated. The sample media are analyzed for gross alpha, gross beta, and isotopic gamma activity by a contract analytical laboratory. After one calendar quarter of samples are collected, they are analyzed at a laboratory for various radionuclides. The results from the analyses are divided by the total volume of air sampled to determine the ambient air concentrations in the environment. See the AIRNET Quality Plan (MAQ-AIRNET) for a detailed description of the project purpose and requirements.

Performing work safely

DO NOT perform work under conditions you consider unsafe. Before beginning work described in this procedure, review safety needs and requirements, identify hazards, and develop hazard mitigation measures. Be aware that facility configurations and hazards may change between visits.

Stormy weather - Reschedule or delay work activities as necessary to avoid areas experiencing severe or dangerous weather.

Fall protection equipment must be used if the performance of work on a sampler requires personnel to work **within 6 feet of the edge of a 6 foot or greater drop.**

Electrical equipment - Work described in this procedure is performed in close proximity to energized equipment. Do not work near exposed conductors.

If electrical conduit at a station is damaged, do not touch the station – instead, call an electrician and request repairs.

Preparing new samples and changing samples

Sample change and processing schedule

Sampler filters (and tritium cartridges; see MAQ-204) are generally changed every two weeks (up to three for some holidays), but may be changed sooner for special situations as directed by group or project managers. Preparation of sample filters (this chapter) is performed generally during the week preceding “changeout” week. Processing and shipping the collected filters generally occurs during the week of changeout.

Equipment and materials

At the “Cave” at TA-54-1001, collect the materials and tools listed below.

- filter media or precut filters
- storage jar
- tweezers
- pneumatic filter cutting tool
- filter heads (whole set either blue or gold)
- plastic caps for filter heads
- glassine envelopes
- Fantastik[®] spray cleaner or equivalent
- Paper towels

Cut new filters

If needed, prepare more new filters by using the pneumatic filter cutting tool according to the applicable IWD. Make a filter by placing the filter material into the tool and cutting a circular filter. Save any ripped or notched filters for use as blanks.

Prepare new sampler heads

To prepare the sampler heads for new samples, perform the following steps:

Step	Action
1	Clean all the filter holders and retaining rings using a damp Kimwipe or paper towel. Wipe out any dust, dirt, or lint from the filter support screen, the retaining ring, and the filter body. Check the o-rings.
2	Using forceps, place a filter into the metal filter head. Make sure the filter paper has been properly positioned in the seat of the head. Screw the ring back on the holder.
3	Punch a vent hole in a plastic cap and install it over the filter head. Check for clear station number markings on the head.
4	Repeat steps 2 and 3 for all the samples, plus 5 trip blanks (87, 88, 89, 98, and 99).

Steps continued on next page.

Preparing new samples and changing samples, continued

Step	Action
5	Take the trip blanks with the filters during changeout and collection; between collections, store the filters in the lab. Ensure these filters are submitted (in about 3 weeks) with the filters just prepared, <u>not</u> with the samples to be collected the next week. Maintain proper chain-of-custody on these samples (see chapter <i>Chain-of-custody for samples</i>).

Working alone policy

The group prefers two people to travel together to collect AIRNET samples. However, it is acceptable for one person to collect samples. In either case, ensure you have a working cellular phone or radio in the vehicle. Follow requirements for field work in the group's All Employee Handbook.

Working in a facility

Work control in a laboratory facility is the responsibility of the Facility Manager. Routine sample collection and pump maintenance activities do not require facility management approval before beginning work described in this procedure; contact the facility manager before any other work. Complete all facility-specific training requirements (see prerequisite training requirements on page 3) and follow any facility-specific work rules, including access requirements.

Working at Pueblos

Work control is the responsibility of the pueblo authorities. Complete the following check in requirements:

- Jemez check in before doing any type of work
- San Ildefonso check in before doing any type of work
- Picuris check in before doing any type of work

Arrangements with some pueblos provide for them to collect their own samples and deliver them to the field team for inclusion in the current sample shipment. AIRNET personnel may occasionally collect the samples at the pueblos.

Working on private property

Each private property owner has a separate arrangement with the group. Check with the project leaders for any special requirements.

Caution at damaged stations

When approaching a station, if the AIRNET station housing appears damaged in such a way that electrical wires are exposed or could be shorted to the housing or conduit, **do not touch the station!** Immediately report the damage and request that an electrician repair the electrical damage.

Preparing new samples and changing samples, continued

Changing the filter heads

Consult Attachment 2 for the locations and directions to the AIRNET sample locations. Travel to each sampler location and perform the following steps at each station.

NOTE: The following steps will also be performed in conjunction with the tritium sampling changeout (MAQ-204).

Step	Action
1	<p>Open the housing and read the timer.</p> <p>If both timer and pump are operating properly, skip to step 4. If the timer is inoperative and the pump <u>is</u> running, record the reading (if any) and note in the comments that the timer is inoperative.</p>
2	<p>If the pump is <u>not</u> running, attempt to restart it by resetting the GFCI and then checking the breaker, checking the power source breaker, or taking other actions. In the case of no power to a pump, use a pointed object (pen, stick, etc.) to press the “TEST” and then the “RESET” buttons on the GFCI box. If there is still no power, check the main power breaker if you can determine where it is. If it is tripped, confirm that no electrical work is in progress, and, if safe to do so, reset it. If these actions fail or cannot be completed, contact the facility manager or the KSL Coordinator. At pueblo sites, notify the appropriate pueblo contact.</p> <p>If the pump is started, skip to step 4. If the pump cannot be started, continue with step 3.</p>
3	<p>If both timer <u>and</u> pump do not operate, consider the sample “rejected for composites” (the sample <u>may</u> be sent for biweekly analyses, at the project leader’s discretion) and skip to step 5.</p>
4	<p>Attach the calibrator to the filter head and read the as-found flow rate for the filter. If, for some reason, a flow reading cannot be obtained when the pump is running, record a final flow rate of 0.</p>
5	<p>Change the sample:</p> <ul style="list-style-type: none"> Remove the used filter head from the quick-connect fitting. Remove the plastic cap from the new filter head and place on the used head. Install the new head on the quick-connect fitting. <p>Make sure the label correctly matches the location and the color of the filter head is correct for the sample period.</p>
6	<p>Attach the calibrator to the filter head and read the flow rate from the calibrator after the new filter head is installed. If needed, adjust the flow to read within $\pm 10\%$ of 4.0 cfm and record the reading.</p>

Steps continued on next page.

Preparing new samples and changing samples, continued

Step	Action
7	Record the following data either on a form (e.g., “Air Monitoring Field Data Form and Chain of Custody Record” [Attachment 3]) or electronically (in accordance with MAQ-216): <ul style="list-style-type: none"> • date and time (recorded automatically by the field computer) • timer reading (hours) • initial (as-found) air flow rate (from step 4) • final (after new filter and cartridge installed) air flow rate (from step 6) • sample I.D., in the following format: a sample collected the week of July 31, 2000 (always a Monday) at station 13 would be 000731.13. Label the QC samples as “station” numbers 87, 88, 89, 98, and 99. • any comments on difficulties encountered, “rejected” sample, estimated data, or other conditions
8	Reset the digital timer by pressing the reset button.
9	Close and secure the sample housing.
10	Follow the requirements in the chapter <i>Chain-of-custody for samples</i> for chain-of-custody documentation and handling.

If sampler is inoperable or damaged

If a sampler is found in an inoperable condition, or if there are other problems that have resulted in a total or partial loss of sampled material or affected the integrity or reliability of the sample, document the condition by recording the condition in the field notebook or Palm computer comments. Record in the comments whether a datum was estimated.

If the condition is simply a power out condition caused by a breaker, document the condition by recording in the field notebook or field computer.

If the condition cannot be easily corrected at the site, also (in addition to the step above) initiate a deficiency report according to the deficiency procedure (MAQ-026).

If the problem is an inoperable pump, also request a pump change in accordance with the procedure for pump calibration (MAQ-205).

Preparing new samples and changing samples, continued

Chain-of-custody documentation

After returning to the “Cave”,

- make a copy of the chain-of-custody form (if data were recorded on paper)
- or
- download the data from the field computers (if data were recorded electronically) to the desktop computer database and print the filter c-of-c forms according to MAQ-216.

Check the data on the forms for errors and keep them in a safe place until samples are shipped. See chapter *Chain-of-custody for samples*.

Critical station checks

Critical station checks

Perform a check of the “critical” AIRNET stations: “compliance” and any other stations as instructed by the project leaders (e.g., non-compliance stations with close to 10% downtime for the year or other sites with special importance).

Most critical stations have a radio frequency (RF) or telephone system installed and can be checked daily via the electronic system installed at the Cave. Other stations may require visits during the “off weeks” (the weeks between sample collection weeks).

Visits to check stations

Where required, travel to the stations that must be checked physically. At the station, record the date, time, timer reading, and both flow meter readings either manually in the logbook (follow MAQ-011 for logbook use) or electronically in the field computer.

- If the pump is not running, follow the instructions on page 7, starting with step 2 through step 9, but do not change the sample (step 5) and do not reset the timer (step 8). Also follow the instructions in the block “If sampler is inoperable or damaged” on page 8.
- If the pump has failed, follow the procedure for pump replacement and calibration (MAQ-205).

Checking stations on electronic system

Stations on the electronic system (either radio or telephone) are programmed to call in and download their data once a day (normally around 5 to 7 am). This appends data to a file for the specific station.

Stations are also programmed to call in when the voltage gets too low or the vacuum switch opens. These “off-normal” call-ins create a separate “shadow” file for the station that has a suffix of “_s” in the file name.

Steps to electronically check the stations

To check the critical stations using the RF or phone system, perform the following steps:

Step	Action
1	If not already on, start the program PC208W. (This program is normally left on so stations can contact the base if they go down.)

Steps continued on next page.

Critical station checks, continued

Step	Action
2	<p>Method 1: Click on the Status tab and scroll down the list of stations to see if all stations have called recently: compare the “Last collection attempt” column and the “Next call” columns.</p> <p>Look for a shadow file (with “_s” suffix) in the list of stations. (To avoid accumulating old shadow files, they should be deleted after the problem at the station is fixed.)</p>
3	<p>Method 2: Select the View tab and click on File, Open. Look for shadow files in the list of files. Select and open the station desired. Scroll to the bottom of the file and look at the Julian day and hour of the last data collected from that station. (Julian days are on the LANL wall calendars.) If the day corresponds with the time the station was supposed to call in (check this time on the Setup tab), then it is reporting in properly.</p> <p>Data format: Station, year, Julian day, hour, main battery voltage, timer battery voltage across the vacuum switch terminals.</p> <p>NOTE: Timer voltage should read around 0 ($\pm 0.1V$) if the vacuum switch is closed (pump running). Timer voltage will be between 1.1 and 2.65 if the vacuum switch is open (pump down).</p>
4	<p>For the stations that are electronically checked, record the status on the form AIRNET Critical Station Checks (Attachment 6).</p>

Preparation for chemical analysis

Background

From January 1997 through March 1999, gross alpha and beta activities were measured after initial isotopic gamma determinations (in “clumps”) on chemically digested samples rather than by instrumental front-face counting as in the past. Half of each individual sample was submitted for alpha/ beta/ gamma and half retained for quarterly compositing for alpha isotopic analysis.

Beginning in April 1999, gross alpha and beta counts have been determined after initial isotopic gamma determinations (in “clumps”) by instrumental front-face proportional counting. Each individual sample will be submitted for alpha/ beta/ gamma and retained at the analytical laboratory for quarterly compositing for alpha isotopic analysis.

Getting materials needed for sample processing

After the AIRNET samples have been changed out, they are prepared and sent to an analytical laboratory for alpha/beta/gamma analyses.

Collect the materials and tools listed below.

- glassine envelopes
- gloves (optional)
- 4” x 4” plastic bags
- permanent marker (if needed)
- cleaning solution (e.g., “Fantastik”)
- chain-of-custody forms (Attachment 3)
- form “AIRNET Filter Clumps” (Attachment 5; contact project leader or analytical chemist for latest version)
- tweezers
- bench paper
- scotch tape
- customer number labels
- Kimwipes or paper towels

Preparing the samples

Perform the following steps to prepare the filters and cartridges for analysis:

Step	Action
1	Make up <u>two</u> sets of small stick-on labels with the sample I.D. (consisting of the year, month, day, and sample station number), or use a black permanent marker to label the glassine envelopes. Prepare small “towelettes” for cleaning the tools.
2	Cover a clean work table with bench paper. Arrange the filter holders on the table and place a glassine envelope labeled with the corresponding station number next to each filter holder. Put on the gloves if it is known that there was a radioactive release from a lab site.

Steps continued on next page.

Preparation for chemical analysis, continued

Step	Action
3	Pick up a sample holder and remove the plastic cover cap <u>slowly</u> to avoid creating a sudden vacuum that can dislodge the filter and collected dust.
4	Unscrew the ring and, using tweezers, remove the filter and place it into a pre-labeled glassine envelope.
5	Fold over the top of the envelope and secure the fold with a small piece of clear tape. NOTE: This may be done after all the filters have been placed into envelopes.
6	Clean the dust off the tweezers on a clean part of a dampened towellette with cleaning solution.
7	Note on the field data form anything observed that might influence the quality of the sample, such as holes through the filters and their approximate diameter (e.g., "Hole in filter, about 1 mm.").
8	Repeat steps 3 through 7 for all filter samples.
9	Group the glassine envelopes into the "clumps" as shown on the latest version of the form "AIRNET Filter Clumps" (Attachment 5). If necessary, contact the project leader or analytical chemist to obtain the latest version of the form.
10	Prepare 3 blank samples using unexposed clean filters. Place the blanks in pre-labeled glassine envelopes marked as stations 91, 92, and 93. If QC spike samples are available, place them in glassine envelopes marked 94, 95 and 96.
11	Mark a ziplock bag (with pre-printed stick-on labels or a black permanent marker) with the sample ID for each clump: yymmdd.Cx, where yymmdd = the date portion of the sample ID, C stands for clump, and x is the letter identifier of the clump.
12	Place each clump of filters in its corresponding ziplock bag.
13	Place each clump bag into a larger ziplock bag and seal the opening with tamper-evident tape.

Preparation for chemical analysis, continued

Prepare the samples for shipment

Immediately after processing the filters as described above, prepare the samples for shipment.

Steps to submit samples for analysis

To complete the appropriate paperwork and submit the samples for analysis, perform the following steps:

Step	Action
1	From the main AIRNET switchboard, select the "Field Sampling" menu, then open the document for the filter shipping template and the filter memo template.
2	Save the file on the local computer (c: or d: drive) with an appropriate unique file name.
3	Replace all "mmdd" with the current date (check the current year).
4	Replace all "xxxx" with the month and day of the sample id (e.g., if sample shipment is 010302, replace the x's with 0302).
5	On letter, "Enclosed with this letter are '??' ...," fill in the "??" with the number of samples to be shipped.
6	In Table 1, place "x's " or checkmarks in column "Included in this Shipment" for all samples submitted.
7	Save the file and exit the program.
8	Run Eudora (e-mail), attach the file created above to a new message, and send to the group secretary.
9	At Group Office, pick up completed letter, shipping manifest, and shipping information sheet.
10	Get a second AIRNET team member to double-check shipping letter, sample ID numbers, dates, and number of samples shipped.
11	Complete the AIRNET Sample Shipping Checklist (Attachment 8). Keep this completed form in the local files in the Cave area for up to one year. This form is not a permanent record.
12	Make 3 copies of the completed memo and shipping information sheet: <ul style="list-style-type: none">• MAQ file• chemistry data coordinator• memo's author.

Steps continued on next page.

Preparation for chemical analysis, continued

Step	Action
13	Make 1 copy of the chains of custody for the validation and verification notebook
14	Put extra set of sample ID labels with samples in shipping container.
15	Take samples, shipping manifest, and other paperwork to shipping.
16	Return signed shipping manifest to the group office.
17	Enter shipping date in sample and data tracking table of the AIRNET database.

Chain-of-custody for samples

Maintaining custody of samples

A sample is physical evidence collected from a facility or the environment. Chain-of-custody must be documented for all samples used to demonstrate compliance. Verify that the possession and handling of samples is traceable at all times. A sample is considered in custody if it is one of the following:

- In one's physical possession.
- In one's view after being in one's physical possession.
- In one's physical possession and then locked up so that no one can tamper with it.
- Kept in a secure area where access is restricted to authorized and accountable personnel only.

NOTE: A secured area is an area that is locked, such as a room, cooler, vehicle, or refrigerator. If the area cannot be secured by locking, use a custody seal to secure the area or the sample container.

Transferring custody of samples

Whenever samples are transferred into the custody of another person or organization, complete the "relinquished by/received by" and "date" sections of the form (Attachment 3 or 4). These sections of the form must provide a complete history of custody of the samples from collection to transfer to the analytical laboratory.

If chain-of-custody is broken

Whenever there is a break in the chain of custody of a sample, document the failure by initiating a deficiency report in accordance with the procedure for deficiencies (MAQ-026). [The deficiency process will document the occurrence, evaluate the potential impact (if any) on the samples, and propose a fix to prevent recurrence.]

Records resulting from this procedure

Records

The following records, or copies thereof, generated as a result of this procedure are to be stored or submitted **within 3 weeks of completion** as described below:

- “Air Monitoring Field Data Form and Chain of Custody Record” (Attachment 3 or version similar to Attachment 4 generated according to MAQ-216) – original with samples shipped to analytical lab, one copy in V&V notebook in TA-54 Bldg. 1005. A second copy may be requested from the analytical lab if necessary.
- completed form “AIRNET Filter Clumps” (Attachment 5) – original with samples shipped to analytical lab, one copy attached to memo (below)
- letter to analytical laboratory requesting analyses – copy filed by group office when letter is generated
- memo (to BUS-4 and the analytical laboratory) detailing the total activity of the shipment (similar to example Attachment 7) – copy filed by group office when memo is generated
- Shipping Manifest – original with samples shipped to analytical lab, one copy to group office

HAZARD REVIEW

Work tasks/Steps	Hazards, Concerns, and Potential accidents; Likelihood/ Severity	Controls, Preventive Measures (e.g., safety equipment, administrative controls, etc.)	Hazard Level from IMP 300-00-00 Hazard Grading Matrix
Collect AIRNET samples according to steps in this procedure.	Thermal burns--skin burns from pumps Occasional/Negligible = Minimal	Use care to avoid these injuries.	Low
As part of sampling work, enter radiation areas and explosives testing areas.	Site-specific hazards such as high explosives testing (TA-15, TA-16, TA-49) or radiation Areas (TA-54- Area-G, TA-16) Remote / Negligible = Minimal	Comply with all site-specific access requirements. Existing facility access controls include site-specific training, sign-in/sign-out, and scheduling procedures. Area-G and TA-15 require entry through manned access control gates.	Low
As part of sampling work at AIRNET stations, work around electrical equipment.	Electrical shock in wet conditions Remote / Catastrophic = Low Electrical shock from electrical conduit damaged by vehicle or large animal Improbable / Catastrophic = Medium	For wet conditions, all stations were retrofitted with GFCI (ground fault interrupts). If damaged station is found with potential for electrical contact in damaged conduit, contact electrician to shut off power prior to any further work.	Low

Wastes or residual materials resulting from process

None.

Emergency actions to take in event of control failure For all injuries, provide first aid and see that injured person is taken to Occupational Medicine (only if immediate medical attention is not required) or the hospital. Notify supervisor and group office as soon as possible. For any exposed, energized electrical wires, contact an electrician or the appropriate authority to turn off the power. Follow all site-specific emergency plans for any radiation or explosives emergencies.

DIRECTIONS TO AIRNET SAMPLING STATIONS

*-- Indicates compliance stations. †-- Indicates background (regional) stations.

Station number	Station name	Directions
1 [†]	Española	On the Northern New Mexico Community College campus on the west side of Española on the Chama highway, east of the two-story science building.
4	Barranca School	Travel north on Diamond Drive to San Ildefonso (past the golf course) and turn left up the hill to Barranca Road. Locate the school on Barranca Road (look north after passing the corner of Loma Del Escolar). The sampler is located on the south side of the school. Master key number M1709 opens the gate.
5	Urban Park	Turn from Diamond Drive onto North Road. This road meets the south end of Urban Park where you will see water tanks to the left. Turn left on the dirt road to see the water tank and follow the road to the end. The sampler is on the right.
6*	48th Street	Turn from Diamond onto Sandia. Proceed around Sandia until you spot the sign for 48th Street and follow it to the gate of the water tanks. Use a ESH-227 key to open the first gate and turn left.
8*	McDonald's	South of the McDonald's on Trinity Drive, south of storage buildings, over the south rim.
9*	Los Alamos Airport	At the east end of Trinity Drive, turn into Los Alamos Airport. Sampler is northwest of the airport terminal building.
10*	East Gate	On Highway 502 out of Los Alamos, proceed past the airport to the abandoned guard tower on the right, across from Los Alamos Diagnostics. The sampler is near the base of tower by the fence.
11*	Well PM-1	At the end of East Jemez Road (truck route), where it ends at SR 4, turn left onto SR 4 and immediately left again onto a dirt road. Drive 200 feet to the well area. The sampler is located west and outside of the service building.
12*	Royal Crest	Off East Jemez Road, turn into Royal Crest trailer court. Around the rear, take the dirt road that goes around the outside (south) of the trailer court. The sampler is in the southern part of the area and is enclosed by a chain-link fence.
13*	Rocket Park	Located near Rocket Park. Find the Smith's grocery in White Rock on Sherwood and make a right turn past the small park. The sampler is located straight ahead, just where the road turns to left.
14*	Pajarito Acres	From SR 4 turn on Monte Rey North. Turn left on Piedra Loop, drive about 0.1 miles to sampler on right.
15*	White Rock Fire Station	In White Rock on Rover Blvd., at the firehouse, in the vacant area on the side of the building.

Station number	Station name	Directions
16*	La Vista Nazarene Church	Proceed to White Rock down Pajarito Road. Continue straight at the light/intersection of SR 4. The church is directly to your right. The sampler sits by the back of the building.
17	Bandelier	From SR 4, turn into the entrance to Bandelier National Monument. Show your badge at the gate and proceed on to the fire tower lookout on the right. Proceed on foot in a westerly direction until you spot the sampler.
20*	TA-21/ Area B	Drive down DP Road. Before the guard gate, you will come to a paved parking area. The sampler is west of the lot by the fence.
23	TA-5	Turn down the entrance to TA-52 and proceed to the transformer station located on the east side of the road. The sampler is located on the east side of the fence.
25	TA-16-450	From station 21, enter the guard station at TA-16. Travel south to S-Site complex. Find road to east from S-Site by following signs to WETF. Turn left and travel to end of road. The sampler is located along the fence behind trailers, after road curves to left.
26	TA-49	Proceed on SR 4 to the entrance to TA-49 (just past mile marker 52). The sampler is at the entrance to TA-49, in the fenced area to the left of the main gate.
27	TA-54/ Area G	Enter the controlled area of TA-54. Inside fence, continue on road along N fence about 1.1 mile from control gate.
30	Booster P-2	Along Pajarito Road, enter the turn off for TA-54. There is a large water tank and pump house to the north. The sampler is located along the south side of the fence. Use a ESH-227 key to gain access.
31	TA-3	Turn west off Diamond Drive at Eniwetok Dr. Immediately turn north in parking lot, then left (west) toward the guard fence. The sampler sits outside the fence.
32*	County Landfill	From the intersection of Diamond and Jemez Roads (near the bridge), turn east onto East Jemez Road and drive one mile to the County Disposal site on the right. The sampler sits on a small hill to the right of the entrance.
34	Area G-1/ NE corner	Enter the controlled area of TA-54. The sampler is located in the far northeastern corner of the area, outside the perimeter fence of Area G. Walk around east side to get to sampler.
35	Area G-2/ back fence	In TA-54, half way down the site along the southern fence. Inside fence, 0.4 mi. From control gate, turn R after building 54-2, left at Y at 0.2 mile, along fence.
36	Area G-3/ office	In TA-54, east of the main office building for TA-54. Inside fence, 0.4 mile from control gate on paved road, on W side of pit #38.
39	TA-49/ QA	Duplicate sampler located at station 26.

Station number	Station name	Directions
45	Area G - SE perimeter	In TA-54, in outer perimeter area southeast of the fence.
47	Area G - N perimeter	In TA-54, in outer perimeter area north of the fence.
49	Pajarito Rd. Sludge Pond	On Pajarito Road to the east of TA-18, at the old sludge pond site, on south side of road.
50	Area G - exp	In TA-54, inside fence, turn right after pit #37, near power pole 2939.
51	Area G - exp pit	In TA-54, inside fence, from entrance control gate, on paved road 0.4 mile, then dirt road 0.2 mile between domes 54-283 and 54-153, turn left after Pit #37 and Pit #38. Sampler is along the north fence of pit near power pole 2942.
54 Discontinued	TA-33 East	Enter TA-33 (south of Bandelier on SR 502), take immediate L to locked gate, use issued key to open gate or get an escort and follow road to satellite antenna.
55 [†]	Santa Fe West	At Buckman Booster #4 along Camino La Tierra, opposite Salva Tierra entrance, west of Bluejay Dr. intersection.
56 [†]	El Rancho	Travel east from Los Alamos on Highway 502 about 3 miles past Otowi, turn left into El Rancho, take next right (east) at "T", turn left on first paved road, turn right on gravel road immediately after bridge, go 0.4 miles and turn left just before cottonwood tree with two signs, follow drive to left. The station is by red well house.
59	Jemez Pueblo	Take State Road 4 west to the town of Jemez Springs (35 miles from Los Alamos). Continue on Highway 4 south 10 miles to the pueblo. The station is located at the visitor center of the pueblo.
60*	Ice Rink	From the main Laboratory area, proceed across the bridge and turn left at the first signal, and left at the bottom of the canyon. Go under the bridge and proceed about 1 mile. The sampler is on the left side of the road.
61*	LA Hospital	Near the intersection of Trinity Drive and Diamond Drive, east of the LA Medical Center building.
62*	Crossroads Bible Church	Off Trinity east of the Los Alamos Crossroads Bible Church building.
63*	Monte Rey S	In White Rock, near the intersection of SR 4 and Monte Rey South.
66*	LA Inn South	South of Los Alamos Inn on north edge of LA Canyon.
67*	Research Park	West of the Fire Station on West Jemez Road across from the main library.
70	San Ildefonso Landfill	From West entrance to San Ildefonso off Highway 502, follow road about 1 mile and turn left toward landfill. Sampler is on left when approaching landfill. Samples are normally collected by Pueblo personnel.

Station number	Station name	Directions
72 Discontinued	TA-21-02	The sampler is located near the middle of the TA-21 perimeter fence.
77 Discontinued 12/04	TA-36 (IJ site)	Enter the guard gate and proceed south to Y intersection. Turn left and travel several miles to TA-15 access control office. If unsure about location and access procedure, ask access control personnel. The sampler is located on south edge of IJ site overlooking canyon.
78 Discontinued	TA-15-N	From station 76, turn left at next road, then veer left to chain across road (signs to R-45). Open chain gate and follow road as it curves right to next site on right. Sampler is to right (SE) of buildings 15-327 and 15-328.
82	San Ildefonso Sacred Land	Northeast of Area G station 50. Need Pueblo escort for access. Samples normally collected by Pueblo personnel. Tritium collection only, solar powered sampler.
84	Picuris Pueblo	Travel N on SR 68 to SR 75, turn right and travel through community of Dixon. Follow signs to Picuris Pueblo (left turn before Penasco). Follow road to administration building and check in; ask for environmental personnel.
90	Eastgate Backup	Located next to station 10 at Eastgate.

*-- Indicates compliance stations. †-- Indicates background (regional) stations.

MAQ, Meteorology and Air Quality

Air Monitoring Field Data Form and Chain of Custody Record

This form is from MAQ-202

Project Contact Contact Phone No. _____ MS _____	Project Name AIRNET -- TOWN LOOP _____ _____	Account Code _____ Cost Center _____ Program Code _____
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Field Sample I.D. Number	Date Collected	Time Collected	Station Number	Station Description	Timer Reading	End Filter CFM	Begin Filter CFM	Matrix	Container Type/Vol.	Analysis Requested	Remarks
.04			4	Barranca				Air Filter	Metal Head	Rad -- See Comments	
.05			5	Urban Park				Air Filter	Metal Head	Rad -- See Comments	
.06			6	48th Street				Air Filter	Metal Head	Rad -- See Comments	
								Air Filter	Metal Head	Rad -- See Comments	
.08			8	McDonalds				Air Filter	Metal Head	Rad -- See Comments	
.09			9	LA Airport				Air Filter	Metal Head	Rad -- See Comments	
.10			10	East Gate				Air Filter	Metal Head	Rad -- See Comments	
.19			19	TA-21/DP				Air Filter	Metal Head	Rad -- See Comments	

Relinquished by (print and sign)	Date Time	Relinquished by (print and sign)	Date Time	Relinquished by (print and sign)	Date Time	Relinquished by (print and sign)	Date Time
Received by (print and sign)		Received by (print and sign)		Received by (print and sign)		Received by (print and sign)	

Samplers (print names and initial) _____

Comments Rad - Alpha, As-73, As-74, Be-7, Beta, Co-57, Co-60, Cs-134, Cs-137, I-131, Mn-54, Na-22, Rb-83, Rb-86, Ru-103, Se-72, Se-75, Zn-65

EXAMPLE OF COMPUTER-GENERATED FIELD DATA FORM AND C-OF-C RECORD

Air Quality Group ESH-17
Air Monitoring Field Data Form and Chain-of-Custody Record
AIRNET Sample Collection

This form is from ESH-17-202

Sample collection loop: Town		Sample matrix: Silica Gel							See cover letter for analyses requested.	
Field Sample ID number	Station name	Date Collected	Time Collected	Timer reading	End Filter Flow	End Gel Flow	Start Filter Flow*	Start Gel Flow*	Comments	
011022.04	Barranca School	10/22/2001	9:31	310	3.9	195	4	200		
011022.80	Western Arizona (formerly	10/22/2001	9:41	310	3.9	205	4	200		
011022.05	Urban Park	10/22/2001	9:51	310	3.6	205	4	200		
011022.06	48th Street	10/22/2001	10:03	310	3.9	185	4	200		
011022.61	LA Hospital	10/22/2001	10:20	308	3.6	215	4	200		
011022.66	Los Alamos Inn - South	10/22/2001	10:25	308	3.9	180	4	200		
011022.08	McDonalds	10/22/2001	10:31	309	3.9	195	4	200		
011022.20	TA-21 Area B	10/22/2001	10:38	309	3.9	205	4	200		
011022.62	Crossroads Bible Church (10/22/2001	11:07	310	4	205	4	200		
011022.09	Los Alamos Airport	10/22/2001	11:15	310	4.1	140	4	200		
011022.10	Eastgate	10/22/2001	11:25	310	3.9	185	4	200		
011022.99	Trip Blank - Town Loop	10/22/2001	0:00	0	0	0	0	0		

Relinquished by (print and sign)	Date Time	Relinquished by (print and sign)	Date Time	Relinquished by (print and sign)	Date Time	Relinquished by (print and sign)	Date Time
Received by (print and sign)		Received by (print and sign)		Received by (print and sign)		Received by (print and sign)	

Samplers (print names and initial):

* Start flows recorded at this date and time apply to the next sample, not current sample.

EXAMPLE OF AIRNET FILTER CLUMPS FORM

Meteorology and Air Quality Group AIRNET Filter Clumps					
This form is from MAQ-202					
MAQ Clump #	MAQ Sample #	Site #	Included in this shipment (check if yes)	Maximum 1998 alpha activity (pCi/ filter)	Maximum 1998 beta activity (pCi/ filter)
00xxxx.CK					
	00xxxx.01	01	x	3.1	44.8
	00xxxx.03	03	x	3.8	46.1
	00xxxx.41	41	x	3.4	40.3
	00xxxx.59	59	x	5.0	44.1
	00xxxx.55	55	x	3.5	54.4
	00xxxx.56	56	x	5.5	62.8
00xxxx.CC					
	00xxxx.11	11	x	3.3	37.1
	00xxxx.13	13	x	2.6	43.0
	00xxxx.14	14	x	3.1	38.5
	00xxxx.15	15	x	2.8	38.6
	00xxxx.16	16	x	2.8	35.8
	00xxxx.63	63	x	2.6	40.7
00xxxx.CD					
	00xxxx.04	04	x	4.1	44.8
	00xxxx.08	08	x	2.6	37.0
	00xxxx.09	09	x	4.0	35.6
	00xxxx.10	10	x	2.9	38.5
	00xxxx.12	12	x	4.2	37.6
	00xxxx.20	20	x	2.9	35.7
	00xxxx.62	62	x	3.4	42.1
	00xxxx.90	90		0.6	28.7
00xxxx.CE					
	00xxxx.05	05	x	3.3	40.6
	00xxxx.06	06	x	2.7	36.6
	00xxxx.07	07	x	2.9	36.9
	00xxxx.32	32	x	4.2	39.0
	00xxxx.60	60	x	3.8	46.0
	00xxxx.61	61	x	3.7	46.6
	00xxxx.66	66	x	N/A	N/A
00xxxx.CF					
	00xxxx.17	17	x	3.2	55.6
	00xxxx.26	26	x	3.0	40.4
	00xxxx.39	39	x	3.4	46.2

Meteorology and Air Quality Group
AIRNET Filter Clumps

This form is from MAQ-202

MAQ Clump #	MAQ Sample #	Site #	Included in this shipment (check if yes)	Maximum 1998 alpha activity (pCi/ filter)	Maximum 1998 beta activity (pCi/ filter)
	00xxxx.76	76	x	3.0	47.1
	00xxxx.77	77	x	2.9	48.1
	00xxxx.78	78	x	3.6	42.7
00xxxx.CG					
	00xxxx.27	27	x	5.8	68.8
	00xxxx.34	34	x	4.3	60.1
	00xxxx.35	35	x	3.5	42.5
	00xxxx.36	36	x	2.6	45.5
	00xxxx.38	38	x	5.9	50.8
	00xxxx.45	45	x	4.0	51.2
	00xxxx.47	47	x	3.3	54.5
	00xxxx.50	50	x	4.5	58.4
	00xxxx.51	51	x	4.8	55.2
00xxxx.CH					
	00xxxx.23	23	x	3.4	36.5
	00xxxx.25	25	x	2.9	46.5
	00xxxx.30	30	x	2.6	37.4
	00xxxx.31	31	x	2.4	47.1
	00xxxx.49	49	x	3.1	44.4
	00xxxx.54	54	x	2.4	48.5
	00xxxx.71	71	x	2.8	40.3
00xxxx.C8					
	00xxxx.98	98	x	N/A	N/A
	00xxxx.99	99	x	N/A	N/A
00xxxx.C9					
	00xxxx.91	91	x	N/A	N/A
	00xxxx.92	92	x	N/A	N/A
	00xxxx.93	93	x	N/A	N/A
00xxxx.CM					
	00xxxx.65*	65	x	N/A	N/A

Est. Total Net Weight = 20 g Total maximum activity = 0.07 nano Curie per gram

Form completed by: _____
Signature Name (print) Date

Comments: _____

Meteorology and Air Quality Group
AIRNET Critical Station Checks

This form is from MAQ-202

Instructions: Use one column for each daily check. Enter a check or "OK" in "Checked" column and sign bottom of column. Enter any **comments** in the AIRNET field logbook.

Station #	Checked	Checked	Checked	Checked	Checked	Checked	Checked
6							
8							
9							
10							
11							
12							
13							
14							
15							
16							
20							
27							
30							
32							
34							
36							
55							
60							
61							
62							
63							
66							
90							
	Date:	Date:	Date:	Date:	Date:	Date:	Date:
	Initials:	Initials:	Initials:	Initials:	Initials:	Initials:	Initials:

After completion, file this checklist in the local files for one year. This checklist is not a permanent record.

EXAMPLE OF MEMO DETAILING TOTAL ACTIVITY OF THE SHIPMENT

Shipping Information

MAQ AIR QUALITY

To: Tom Houston Mmdd, 1999
From: Alice Baumann, J978/5-8857
Subject: Samples being sent for radioactivity analysis Mmdd, 1999

These air filter samples are being shipped to an analytical laboratory for radioactivity analysis to determine specific levels of alpha, beta and gamma activities. These are environmental samples, and are expected to contain only the low-levels of those isotopes found in environmental samples. The major isotopes are presently unknown, but the samples might reasonably be expected to contain traces of: U, Pu, Be-7, K-40.

Similar samples have been collected at LANL for the past 25 years. Maximum levels of radioactivity actually observed in the bi-weekly samples taken during 1998 from the same locations (table attached for your reference) have been used to calculate the maximum radioactivity that could be contained in this shipment:

0.07 nanocuries/gram of sample, net weight.

<p align="center">Meteorology and Air Quality Group AIRNET Sample Shipping Checklist</p> <p align="right">This form is from MAQ-202</p>	
Sample ID:	
	Initials:
Check shipment date on cover letter (2 locations)	
Check shipment date on shipping info memo	
Check that the number of actual samples match the number indicated on the letter	
Check that the sample set on Chain-of-Custody matches the sample set on the letter	
Check that all the samples marked with an "X" are on the Chain-of-Custody form	
Check that the number of samples on the Chain-of-Custody equals the number of actual samples	
Count the sample boxes of samples to be shipped; be sure they equal the number indicated on letter	
For the filter set, ensure the actual clumps to be shipped are listed on pp. 3 & 4 of letter. For the silica gel shipment, ensure data file was created and submitted to the analytical laboratory.	
Check that sample ID's match Chain-of-Custody field ID sample numbers	
Look over Chain-of-Custody forms and make any necessary changes (initial all changes)	
Check for all signatures on the C-of-C forms, note that shipping prep completed, and note shipping completed.	
Make two copies of C-of-C forms; ensure any changes or corrections are on copies	
For filters, include extra set of sample ID labels.	
Note tracking of shipment in Access database	

After completion, file this checklist in the local files for one year. This checklist is not a permanent record.

Meteorology and Air Quality Group

AIRNET Critical Station Checks

This form is from MAQ-202

Instructions: Use one column for each daily check. Enter a check or "OK" in "Checked" column and sign bottom of column. Enter any comments in the AIRNET field logbook.

Station #	Checked	Checked	Checked	Checked	Checked	Checked	Checked
6							
8							
9							
10							
11							
12							
13							
14							
15							
16							
20							
27							
30							
32							
34							
36							
55							
60							
61							
62							
63							
66							
67							
90							
	Date:	Date:	Date:	Date:	Date:	Date:	Date:
	Initials:	Initials:	Initials:	Initials:	Initials:	Initials:	Initials:

After completion, file this checklist in the local files for one year. This checklist is not a permanent record.

Meteorology and Air Quality Group
AIRNET Sample Shipping Checklist

This form is from MAQ-202

Sample ID:	Filters	Tritium
		Initials:
Check shipment date on cover letter (2 locations)		
Check shipment date on shipping info memo		
Check that the number of actual samples match the number indicated on the letter		
Check that the sample set on Chain-of-Custody matches the sample set on the letter		
Check that all the samples marked with an "X" are on the Chain-of-Custody form		
Check that the number of samples on the Chain-of-Custody equals the number of actual samples		
Count the sample boxes of samples to be shipped; be sure they equal the number indicated on letter		
For the filter set, ensure the actual clumps to be shipped are listed on pp. 3 & 4 of letter. For the silica gel shipment, ensure data file was created and submitted to the analytical laboratory.		
Check that sample ID's match Chain-of-Custody field ID sample numbers		
Look over Chain-of-Custody forms and make any necessary changes (initial all changes)		
Check for all signatures on the C-of-C forms, note that shipping prep completed, and note shipping completed.		
Make two copies of C-of-C forms; ensure any changes or corrections are on copies		
For filters, include extra set of sample ID labels.		
Note tracking of shipment in Access database		

After completion, file this checklist in the local files for one year. This checklist is not a permanent record.